**I/WE CLAIM:**

Sub A1

1. A process for optical filter construction, the process comprising the steps of:

growing amorphous silicon layers via self limiting pulsed molecular beam deposition;

growing diamond-like carbon layers via an ion-based process;

monitoring, during deposition, the layer growth, via interferometric technique capable of sub-angstrom resolution;

monitoring intrinsic stress using an in-situ cantilever-based intrinsic stress optical monitor;

adjusting the intrinsic stress via deposition parameter modification;

depositing the layers onto a substrate;

monitoring indices of refraction during deposition via an in-situ ellipsometer;

measuring surface roughness using a reflection technique chosen from the group comprising: p-polarized reflection spectroscopy, phase modulated ellipsometry, and real-time atomic force microscopy;

directing a focused beam of energetic oxygen ions across the diamond-like carbon at near grazing incidence; and,

repeating the process as necessary, alternating the silicon and carbon layers.

2. A process for optical filter construction, the process comprising the steps of:

growing a high index layer;

growing a diamond-like carbon layer;

monitoring layer growth;

monitoring intrinsic stress;

adjusting intrinsic stress, if necessary;

depositing the high index layer onto a substrate;

depositing the diamond-like carbon onto the high index layer;

monitoring indices of refraction;

directing an ion beam onto the carbon layer; and,

reducing the carbon layer until the carbon layer is approximately atomically smooth.

Sub A1

3. The process of claim 2, wherein monitoring layer growth comprises the step of:

monitoring, during deposition, the layer growth via interferometric technique capable of sub-angstrom resolution.

4. The process of claim 3, wherein monitoring intrinsic stress comprises the step of:

monitoring intrinsic stress using an in-situ cantilever-based intrinsic stress optical monitor.

5. The process of claim 4, wherein adjusting intrinsic stress comprises the step of:

adjusting the intrinsic stress via deposition parameter modification.

6. The process of claim 5, wherein monitoring indices of refraction comprises the step of:

monitoring indices of refraction during deposition via an in-situ ellipsometer.

7. The process of claim 6, wherein after monitoring indices of refraction during deposition via an in-situ ellipsometer, the process comprises the step of:

measuring surface roughness using a reflection technique chosen from the group comprising: p-polarized reflection spectroscopy, phase modulated ellipsometry, and real-time atomic force microscopy.

8. The process of claim 7, wherein directing an ion beam onto the carbon coated high index layer comprises the step of:

directing a well-focused oxygen ion beam onto the carbon layer at near grazing incidence.

Sub A1

9. The process of claim 8, wherein reducing the carbon layer until the carbon layer is approximately atomically smooth comprises the steps of:

rastering the ion beam in a sweeping fashion to allow interaction with only the carbon which protrudes above average surface height, the rastering being continued until the surface roughness is approximately less than 0.01 nanometers.

10. An optical filter constructed using the process of claim 2.

11. An optical filter comprising:

a substrate;

a high index layer; and DLC

a planarized diamond-like carbon layer, the carbon layer having a surface roughness of less than 0.05 nanometers.

12. The filter of claim 11, wherein the filter has alternating multiple layers of the high index layer and the diamond-like carbon layer.

13. The filter of claim 12, wherein the high index layer is silicon.

14. The filter of claim 13, wherein the surface roughness is approximately less than 0.01 nanometers.

15. An atomic layer controlled optical filter system, the system comprising:

Sub A1

a substrate;

a high index layer;

a diamond-like carbon layer;

means for monitoring layer growth;

means for monitoring intrinsic stress;

means for adjusting intrinsic stress, if necessary;

means for depositing the high index layer onto a substrate;

means for depositing the diamond-like carbon onto the high index layer;

means for monitoring indices of refraction;

means for directing an ion beam onto the carbon layer; and,

means for reducing the carbon layer until the carbon layer is approximately atomically smooth.